MAXIMIZING ECONOMIC YIELD (MEY) UNDER LIMITED CAPITAL 1/

by

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INTRODUCTION

Like it or not, the world is forcing wheat farmers to aim for maximum economic yield. While the term sounds intimidating, Maximizing Economic Yield (MEY), is actually a simple concept. **MEY is "growing that yield which nets you the most profit".**

Chances are that you are already farming with some form of a MEY philosophy. You add extra inputs only if they promise to make a positive return on the investment. So what's the big deal about MEY?

The cost/price squeeze facing wheat farmers is the big deal! **As the gap between price and cost continues to narrow, how you use your money becomes more and more critical.**

PURPOSE

The purpose of this paper is to: (1) document the cost/price squeeze facing North Dakota spring wheat farmers during the rest of this decade, (2) discuss how North Dakota farmers and North Dakota State University is currently responding to the cost/price squeeze, and (3) report on a NDSU Extension Economics applied research project entitled **"MEY With Limited Capital".**

PART I. THE COST/PRICE SQUEEZE ON WHEAT FARMERS

The U.S. Food Security Act of 1985 has had a general reverberation on world wheat prices. The lower loan rate has caused competitors to lower their prices to keep their FOB equivalent below the U.S. market price level. The issuance of generic certificates has had the net effect of allowing U.S. cash wheat prices to fall below current loan rates during the 1986/87 market year. This situation makes U.S. exports more competitive, forcing other countries to respond by lowering their wheat prices. Since 1980, average annual wheat prices have declined in Agentina, Australia, Canada, and the United States (see Figure 1).

U.S. Wheat Prices

The impact of current U.S. wheat policy on domestic wheat prices becomes quite clear as one studies U.S. wheat prices over the last few years. Figure 2 clearly illustrates the U.S. free market price is moving downward. It is the intent of U.S. policy makers to make U.S. a world wheat competitor.

1/ Paper presented at Soils And Crops Workshop; University of Saskatchewan; Saskatoon. Saskatchewan; Canada. February 18, 1988.

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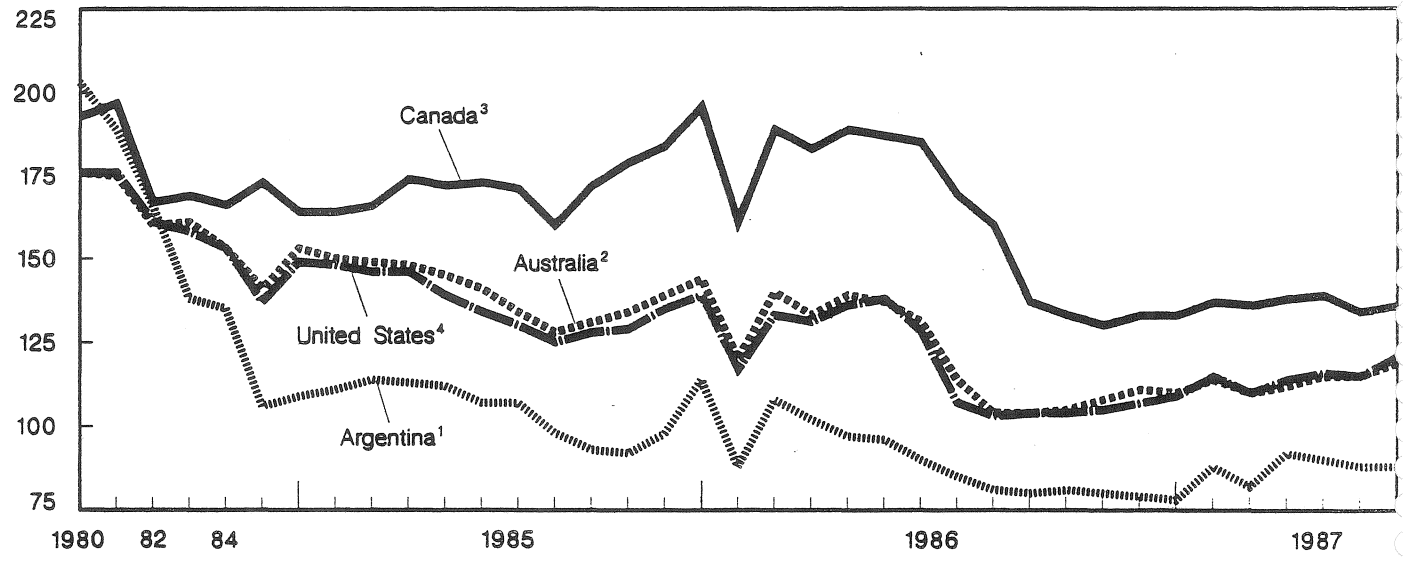
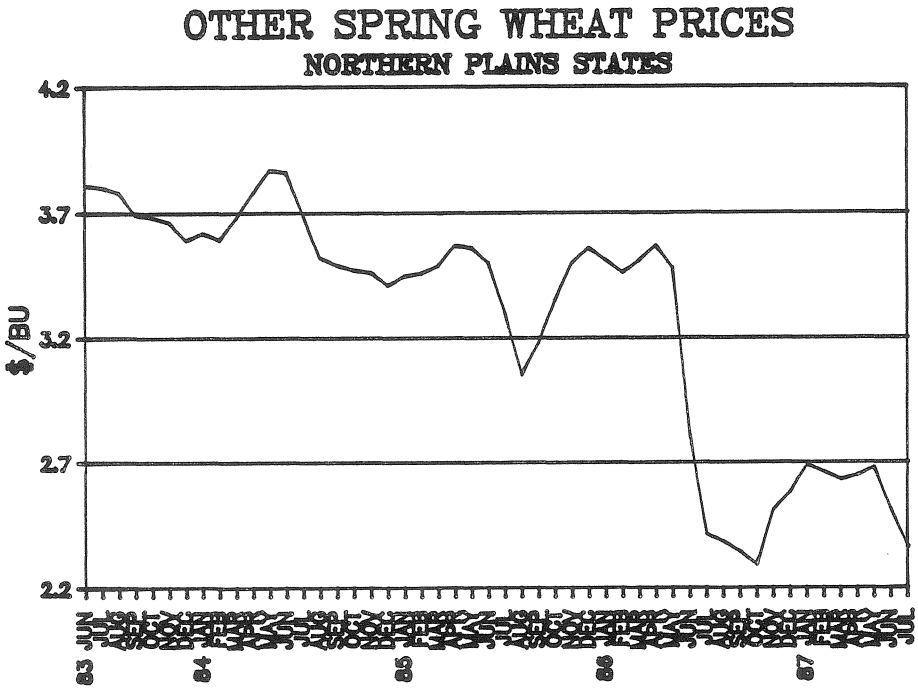
Figure 1. Wheat Prices For The United States And Major Competitors



1/ FOB Buenos Aires.
2/ FOB Standard White.
3/ Canadian winter red. FOB Thunder Bay.
4/ U.S. #2 Hard Red Winter. FOB Gulf.

FIGURE 2. Spring Wheat Prices For Northern Plains States (ND, SD, MINN)



Budgeted Costs Of Producing Wheat In East Central North Dakota

Crop budgets prepared by NDSU Extension's Economics Section suggests that production costs for North Dakota continued to increase from $114 per acre of wheat in 1981 to a peak of $145 in 1986. Set-aside costs are not included and land charges are held constant. This cost increase was primarily due to increased fertilizer, machinery repairs, and machinery ownership costs. Direct costs, on-the-other-hand, peaked in 1984 at $69 per acre and have trended

downward since. Reduced fuel and lubrication costs, as well as changing herbicide costs, made up most of the direct cost change from year to year. Our data suggests that total costs per bushel peaked in 1986 and that costs actually decreased in 1987. We project that costs will increase slightly in 1988 due primarily to increased fertilizer costs.

Table 1. BUDGETED SPRING WHEAT COSTS OF PRODUCTION
EAST CENTRAL NORTH DAKOTA

	1981	1982	1983	1984	1985	1986	1987
YIELD GOALS	40_1/	40_1/	40	40	40	40	40
DIRECT COSTS/ACRE	49.50	67.04	67.99	68.81	67.63	67.84	62.21
DIRECT COSTS/BU	1.23_1/	1.92_1/	1.70	1.72	1.69	1.70	1.56
INDIRECT COSTS/ACRE	64.58	68.12	70.21	71.69	76.57	77.31	74.00
TOTAL COST/BU	2.86_1/	3.38 1/	3.46	3.51	3.61	3.63	3.41

SOURCE: Steve Edwardson, Trends In Crop Production Costs, East Central North Dakota NDSU Extension Handout, Fall 1987.
_1/ Modified yield from original 35 bushels to 40 bushels per acre so that all year' data are at the same yield goal.

Cost/Price Squeeze For North Dakota Spring Wheat Farmers

While protein premiums have not been taken into account, Table 2 suggests that calculated economic profits based on the free market prices were positive during the early 1980's and became negative for the last three years. The abrupt change in the free market wheat price resulting from the 1985 Farm Bill is amplifying the cost/price squeeze (see right hand column in Table 2). If a farmer stays out of the U.S. Farm Program, the Cost/Price Squeeze is on!

Table 2. THE INGREDIENTS OF THE COST/FREE MARKET PRICE SQUEEZE ON NORTH DAKOTA SPRING WHEAT FARMERS

YEAR	MINNEAPOLIS FREE MARKET 14% PROTEIN 1/ (Ju,Au,Sep)	BASIS	NORTH DAKOTA PROJECTED WHEAT PRICE_4/ (Free Market)	BUDGETED COSTS OF PRODUCTION	CALCULATED ECONOMIC PROFITS ($/BU)
1982	$4.05	$.50	$3.55	$3.38_3/	$0.17
1983	4.35	.50	3.85	3.46	0.39
1984	4.13	.50	3.63	3.51	0.12
1985	3.70	.50	3.20	3.61	-0.41
1986	2.90	.50	2.40	3.63	-1.23
1987	2.94 2/	.50	2.44	3.41	-0.97

1/ Source: "Wheat Situation And Outlook Report", USDA, September 1987, p. 24.
_2/ July and August data only as September's prices were not available.
3/ Budget costs of production were adjusted to the 40 bushel yield goal used for the 1983-1987 calculations.
4/ Does not take into account protein premiums.

U.S. FARMERS ARE PROTECTED FROM THE COST/PRICE SQUEEZE BY THE FOOD SECURITY ACT

> The Food Security Act of 1985 was written when the volume and value of U.S. agricultural exports had experienced sharp declines, when the world was awash in surplus agricultural commodities, and when the U.S. farm economy was suffering its worst financial conditions since the 1930's. 3/

The Food Security Act of 1985 has provided considerable relief from the free market's potential cost/price squeeze. Over the past five years, U.S. wheat growers' enrollment in acreage reduction programs has increased from a low of 60 percent of base acreage in 1984 to near 85 percent of base acres in 1987. Program participation has reduced the harvested area from 67 million acres in 1984 to 55 million acres in 1987. This is a drop of 18 percent in harvested acres in only three years.

Most U.S. producers will likely again seek U.S. target price protection in 1988. Participants in 1988 will be required to idle 27.5 percent of their base acreage to be eligible for the program benefits. A projected schedule of U.S. wheat support prices for the rest of this decade is given in Table 2.

TABLE 2. Wheat Target Prices And Loan Rates, Actual and Projected 1985-90

	1985	1986	1987	1988	1989	1990
Target Price	4.38	4.38	4.38	4.23	4.16	4.00
Loan Rate:						
Basic	3.30	3.00	2.85	2.76	2.52_1/	2.49_1/
Actual	3.30	2.40	2.28	2.21		

_1/ Projected based on a maximum reduction of 5 percent for 1989 and 1990.

After adjusting for participation requirements, the net returns for program participation is running approximately $1.00 per bushel below the Target Price established by the Government Program._4/ It has been suggested that the program participation returns will decline from $3.33 per bushel in 1987 to $3.03 by 1990. This represents a $0.30 per bushel decline or approximately $12 per acre for the typical Central North Dakota spring wheat farmer. The program participation price, as calculated by Purdue Agricultural Economists, are still projected to be less than the costs of production for 1988-1990 time period. Profits for North Dakota spring wheat farmers will have to come from durum's higher prices and HRS wheat's protein premiums.

3/ Cris Hurt and Bob Jones, "Farm Act Charts Policy Through 1990 Crop", The New Ballgame Coming Opportunities In Agriculture Proceedings, Purdue University Cooperative Extension Service, Jan 1988, page II-7.

4/ Op. Cit., pg. II-11.

U.S. wheat support price is scheduled to decline the rest of this decade. Current supply/demand conditions are encouraging and free market price could strengthen. It is possible that the U.S. free market price could exceed program loan price; however, it will not exceed the target price.

PART II. RESPONSE TO THE COST/PRICE SQUEEZE

North Dakota Farmers Response To The Cost/Price squeeze_5/

North Dakota farmers are using many management strategies to overcome the cost/price squeeze developed under the Food Security Act of 1985. North Dakota farmers have already postponed capital purchases (62.3%), reduced tillage operations (49.4%), reduced family living (46.9%), cut back on fertilizer and chemicals (26.7%), begun to use crop insurance (10.7%) and switched from cash to share rent (3.3%).

The desire to better manage the use of fertilizer and chemicals in the production process was the most often mentioned adjustment. The researchers go on to say:

> It is presumed that many producers feel a number of low-cost refinements can be applied to the use of these two inputs, such as increased use of soil testing, selection of least-cost fertilizers, better knowledge of fertility needs of each crop grown, proper calibration of spraying equipment, and identification of the most appropriate chemical for the weed problems of individual fields." A number of operators indicated that they wanted to change cropping patterns._6/

In summary, the cost/price squeeze is forcing many North Dakota farmers to change their farming operations and family living budgets.

North Dakota spring wheat farmers are looking hard for information on how they can adjust to the current cost/price squeeze. The "farm input" industry, also feeling the farmers' cost/price squeeze, is looking for ways to increase farmers' purchased inputs. This, then, is the foundation of the new emphasis on Maximizing Economic Yield (MEY)._7/

_5/Brenda Ekstrom, Wally Hardie, and Larry Leistritz, "Management Adjustments In Face Of Farm Financial Stress", North Dakota Farm Research, Vol 45, No. 2, pp 3-6.

_6/Op. Cit., pp 3-6.

7/ Most literature defines MEY as Maximum Economic YIeld. I have changed the word maximum to maximizing to put more emphasis on the "E" in MEY.

NDSU Extension Economics Response To The Cost/Price Squeeze

Agronomic researchers on both sides of the border are evaluating Maximizing Economic Yield (MEY) of cereal crops. The recommendation is generally to reduce production costs per bushel by stressing Intensive Cereal Management (ICM). Research trials continue to suggest that more intensive farming will help farmers cope with the current cost/price squeeze.

ICM requires that each and every production detail receive management's detailed attention. Not only must resource quantities be optimum under ICM, timing of applications must also be optimum. Clearly, the labor requirements of ICM are higher than conventional yields. It is hypothesized that labor requirements may by one of the most constraining resources for farmers considering ICM.

The ICM philosophy is that additional resources are to be applied as long as the marginal return from that resource pays back the principal plus the interest; i.e., the profit maximizing rule for unlimited operating capital. Production risk may go down with ICM as the chances of a crop failure are reduced if all inputs are utilized at the optimum level. The financial risk of crop failure due to weather, however, is not directly factored into ICM recommendations.

As suggested by the 1987 results from North Dakota's MEY Clubs, ICM may not yield better economics results under weather stress. While research data suggests that economic returns go up with ICM in good weather, the economic cost of weather failures also goes up with ICM; i.e., financial risk goes up with ICM. If farmers perceive that one bad year could lead to financial failure, they may well back off from ICM.

The financial crises of the past five years has left some North Dakota farmers with limited operating capital. This capital limit is frequently self imposed (internal limitation) or it can be banker imposed (external limitation). Whatever the reason, we have North Dakota farmers wanting to farm with limited capital.

PART III. FARMING WITH LIMITED CAPITAL

A group of North Dakota farmers came to one of our county extension offices in the Spring of 1987 and asked the County Agent to tell them how to farm without borrowing operating capital. The agent's first response was to not farm. This was not an acceptable answer to the farmers! This agent's request for help from the State office lead to the formation of our "MEY With Limited Capital" project.

In response to the farmers' request, an Area Economist and an Area Agronomist set out to farm on paper with limited capital. Their first step was to establish the recommended resource requirements for different yield goals of durum wheat and to study how capital requirements changed with the different yield goals. The middle yield goal was the conventional yield goal expected for the area, the top yield was the ICM yield goal established by researchers, and the low yield goal was a Reduced Input Farming (RIF) yield goal suggested by the research team. Table 3 presents the resource requirements and the enterprise budgets constructed for three durum wheat yield goals.

The main difference in production practices among the production systems was the use of fertilizer, chemicals, and fungicides. The conventional system applied fertilizer, chemicals, but no fungicides. The ICM system applied more fertilizer, same amount of chemicals and added a fungicide. The RIF system assumed that planting was a little later so that weed control was done by tillage rather than being controlled with chemicals. A smaller amount of fertilizer was applied in the RIF system along with no chemicals or fungicides being applied.

Gross income from the three production systems ranged from a low of $104 for the RIF system to $214 for the ICM system. Cash production costs ranged from $20 per acre for the RIF system to $75 for the ICM system. Returns over variable costs ranged from $84 per acre on the RIF system to $139 on the ICM system. Clearly, returns over variable costs per acre were maximized with the highest yield goal per acre of land -- the ICM recommendation. This assumes, however, that land is the most limiting resource.

Returns Per Dollar Of Operating Capital

Let's now concentrate on operating capital and assume that it is the most limiting resource. The high yield goal for the durum wheat budget projects a $1.84 return per every dollar of operating capital invested. This was calculated by:

$$\text{Return/\$} = \frac{\text{Returns Over Variable Costs}}{\text{Total dollar cost}}$$

$$= \frac{\$138.77}{\$75.48}$$

$$= \$1.84$$

This suggests that for every dollar invested in operating costs, that the ICM yield would return $1.83.

Further analysis demonstrates the economic law of diminishing returns. Every dollar of operating capital invested in the RIF system's would yield a return of $4.12, every dollar of operating capital invested in the conventional system would yield a return of $2.21, and every dollar invested in the ICM system would yield a return of $1.83. As more and more operating capital is invested per acre of durum wheat, a lower return per dollar invested is projected.

The conclusions arrived at by these researchers are: (1) the returns to operating capital invested changes with the yield goal and (2) the returns per dollar of operating capital may be highest with Reduced Input Farming (RIF).

TABLE 3. MULTIPLE YIELD GOAL BUDGETS FOR DURUM WHEAT IN CENTRAL NORTH DAKOTA (1987)

	RIF	CONVENT	ICM
YIELD GOAL IN BU./ ACRE	15.00	40.00	55.00
INCOME:			
COMMODITY	41.25	110.00	151.25
GOVT PAYT	63.00	63.00	63.00
TOTAL	104.25	173.00	214.25
CASH COSTS:			
SEED	3.13	5.63	6.75
FERTILIZER	0.00	10.60	17.28
CHEMICALS	2.00	13.50	13.50
FUNGICIDES	0.00	0.00	12.00
FUEL COSTS			
CULTIVATIONS	0.96	0.96	0.96
PLANTING	0.64	0.64	0.64
ROW CROP	0.00	0.00	0.00
SWATHING	0.68	0.68	0.68
COMBINING	3.00	4.00	4.00
TRUCKING	0.60	1.60	2.20
DRYING	0.00	0.00	0.00
FALL TILL	1.20	1.20	1.20
REPAIRS	5.00	6.00	6.00
INSURANCE	0.00	4.00	4.00
INTEREST	1.03	2.93	4.15
ACR COSTS	2.12	2.12	2.12
TOTAL COSTS	20.37	53.86	75.48
RETURN OVER VARIABLE COSTS	83.88	119.14	138.77

Price of N fertilizer	$0.11	Crop Price $/bu.	$2.75
Price of P fertilizer	$0.16	Program yield bu/acre	30.00
Crop deficiency rate	$2.10		

How Does Return On Operating Capital Compare Among Enterprises?

Budgets for other Central North Dakota crops were constructed for alternative yield goals. Each crop and alternative yield goal had a different projected return to operating capital (see right hand column in Table 4).

Note that while some crop budgets (durum, winter wheat and barley) suggest that RIF will increase returns to limited operating capital, the 50/92 wheat, 50/92 barley and rye had the highest returns to limited capital from the higher yields.

Given the data in Table 4, one would maximize the returns to limited capital by planting 50/92 wheat._8/

TABLE 4. 1987 CROP BUDGET SUMMARY FOR CENTRAL NORTH DAKOTA

CROP ENTERPRISE		CROP VALUE	DEFICIENCY PAYMENT	CASH COSTS	PRICE OBJECTIVE	RETURNS PER $ OP. CAP.
Winter Wheat _1/	-20 bu	46	63	23	86	3.74
	-40 bu	91	63	33	121	3.67
	-60 bu	137	63	58	141	2.43
Wheat 50/92	-15 bu	34	116	27	123	4.55
	-40 bu	91	116	52	155	2.98
Barley:						
Green Manure		--	44	9	35	3.88
1.75 Tons Hay		35	44	20	77	3.85
	-20 bu	30	44	20	54	2.70
	-60 bu	89	44	46	88	1.91
	-80 bu	118	44	71	92	1.30
Barley 50/92	-20 bu	30	82	27	84	3.11
	-60 bu	89	82	52	118	3.62
Winter Rye	-25 bu	40	--	16	23	1.44
	-45	71	--	27	44	1.63
Soybeans	-20 bu	91	--	44	47	1.07
Sunflowers	-1200 lbs	78	--	43	35	0.81
flax	- 18 bu	68	--	39	29	0.43

_1/ Winter wheat is grown in East Central North Dakota; however, winter wheat is a higher risk crop as it needs to be covered with snow to survive our cold winters.

_ 8/ The reality of including set-aside requirements further complicates this analysis. It will be shown later in this paper that set-aside requirements make the 50/92 enterprises less competitive even with limited operating capital.

The next most profitable crop under limited operating capital would be green manure barley. The other crops can be ranked according to the returns per dollar of operating capital (the right-hand column in Table 4).

The above analysis leads to a dichotomy in our MEY recommendations. **Intensive Cereal Management** becomes the MEY with unlimited capital while **Reduced Input Farming** becomes the MEY under limited capital.

It is difficult to generalize about MEY production systems. The problem, then, became one of how do you identify MEY with many different alternative crops each with alternative yield goals?

Linear Programming

Farm management researchers have long utilized linear programming to sort through large numbers of enterprise budgets. Linear programming selects the combination of enterprises that will maximize returns to the limited resources. Linear programming lends itself best to evaluating the overall organization of the farm business where a manager needs to examine several alternative enterprise budgets. This was exactly the situation of the MEY With Limited Capital project.

We set out to build a proto-type of an On-Farm Linear Programming MEY Model designed to allow North Dakota farmers to select profit maximizing: (1) enterprises and (2) yield goals. This proto-type MEY model was designed around the central North Dakota enterprise budgets in Table 4.

The study farm was assumed to have 1,000 acres of tillable land with a 50 percent program acreage base (See Table 5). Wheat base was assumed at 400 acres and barley based was assumed at 100 acres. The operator specified that he did not want to grow more than 100 acres of soybeans.

This analysis includes the option to rent-out land at $20 per acre; however, each acre rented out included 0.4 acre of wheat base and 0.1 acre of barley base. Land was also permitted to be idle with no costs.

Table 5. Resource Limitations Considered

Resource	Level
Operating capital	Varied
Tillable acres	1,000 Acres
Wheat base	400 Acres
Barley base	100 Acres
Soybean max	100 Acres
ACR Acres	As Required
Rent-Out Acres	Allowed with Base
Idle Acres	Allowed

Simulation Results

The control for this experiment was to run the proto-type MEY model for this study farm with unlimited capital. The results are presented in Table 6. All limited capital runs, then , can then be compared to the control run.

The optimum plan for the control run generated $70,681 return over variable costs of production. This is labeled "contribution to overhead" as fixed costs are not yet taken out._9/

The optimum cropping plan called for 80 acres of 80 bushel barley, 290 acres of 60 bushel winter wheat, 130 acres of set-aside acres (ACR), 100 acres of 20 bushel soybeans, and 400 acres of 45 bushel rye. This corresponds to the ICM yield goals for all selected crops. This is the unlimited capital optimum solution requiring $40,000 of operating capital. This averages out to $40 per crop acre.

Table 6. Unlimited Capital Solution

Barley 80 bu	80 acres
Wheat 60 bu	290 acres
ACR	130 acres
Soybeans 20 bu	100 acres
Rye 45 bu	400 acres
Total	1000 acres
Returns over cash costs	$70,681

A second run was made with the proto-type MEY model limiting operating capital to $20 per crop acre. The optimum plan is presented in Table 7. Note that the optimum cropping plan with $20 operating capital changed substantially from the unlimited capital run. Winter Wheat was grown up to the limit of base but the yield goal was reduced to 40 bushels per acre. Barley acres were reduced as well as the barley yield goal was reduced to 20 bushel per acre.

Note that the optimum plan for $20 per acre of operating capital called for some land to be left idle. This idled land was not rented out because base acres were more profitable being farmed rather than being included as part of the rental package. What is important to note here is that: (1) the optimum cropping plan changed as operating capital was reduced and (2) the optimum yield goals changed for all the crops except the rye.

9/The contribution to overhead is the dollars left over to pay for: (1) fixed costs such as depreciation, interest on investment capital debt, repairs of the fixed plant (machinery repairs are paid in variable costs), real estate taxes, and insurance (excluding crop insurance), (2) debt repayment (excluding operating capital), (3) family living, (4) Income taxes and Social Security, and (5) cash rent (if multiple year contract).

Table 7. Limited Capital Solution
$20/acre

Barley 20 bu.	55 acres
Wheat 40 bu.	290 acres
ACR	130 acres
Rye 45 bu	327 acres
Barley hay	25 acres
Soybeans	-- acres
Idle	173 acres
Total	1000 acres
Returns over cash costs	$54,496

Repeated Runs With Alternative Levels Of Operating Capital

If the total farm was rented out at $20 per acre, the total rental income would be $20,000.

With just $5 per acre of operating capital(a total of $5,000), the optimum solution farmed 133 acres of 40 bushel winter wheat and 37 acres of barley hay and barley green manure along with 60 acres of necessary ACR required by the Government Program._10/

The remainder of the land included 541 acres rented out and 230 acres idled. While the gross margin of $29,320 from this solution may be well short of what is desired, it represents a $9,320 increase over renting out all of the land.

A significant change occurs as operating capital was increased to $10 per acre. Two-hundred and seventy-four (274) acres of winter wheat came into the optimal solution at the 40 bushel yield goal. Twenty-five (25) acres of barley hay also came in under the assumption that the barley hay could be sold as a cash crop. An additional 50 acres of barley used as green manure came in. A total of 123 acres of ACR land was required to meet the Government Program set-aside requirements of the wheat and barley. Land rented out decreases substantially to 55 acres and land idled increases to 473 acres. This large acreage was idled rather than rented out because it was profitable to farm the base acres. This was nearly enough operating capital to farm all of the wheat base. This farmer now was projected to take in $38,072 dollars over variable costs. A gain of $18,072 over renting out the land.

_10/Post-optimal analysis indicates that only a $0.25 increase in net returns would have 20 bushel barley replacing the barley hay and/or green manure. Therefore, I could have stated that the 37 acres of barley base was planted to 20 bushel barley.

As operating capital was increased to $15 per acre, 141 acres of 45 bushel rye is included. Winter wheat at 40 bushels per acre came in at the 290 acre wheat base limit, ACR was in at 129 acres and 20 bushel barley came in. The option to rent out some of the land for $20 per acre no longer enters the optimum solution. Idling of land, however, remains a part of the optimum solution until operating capital reaches $25 per acre.

The $20 per acre solution has already been discussed.

At $25 operating capital per acre, 60 bushel barley came in at 13 acres, barley hay was limited to 25 acres, and 20 bushel barley came in at 42 acres. Forty-five bushel rye was in at 500 acres and 40 bushel winter wheat was in at 290 acre base limit. ACR was in at 130 acres. Returns over variable costs were now exceeding rent by $42,538.

At $30 per acre, the optimum solution begins to include 155 acres of 60 bushel winter wheat but still maintaining 134 acres of 40 bushel winter wheat. Forty-five bushel rye was in at 500 acres and 60 bushel barley in at the 100 acre base limit. Returns over variable costs have increased to $47,089 over renting out the land. This is only $4500 over the $25 operating capital level.

At $35 per acre, the solution included 290 acres of 60 bushel winter wheat, 80 acres of 60 bushel barley, and 437 acres of 45 bushel rye. The government programs required 130 of set-aside acres. The non-program crops were split between 62 aces of 20 bushel soybeans and 437 acres of 45 bushel rye. Returns over variable costs now exceeded the land rental option by $50,225. This was the first solution to include all Intensive Cereal Management yield goals.

As operating capital became unlimited ($40/acre), soybeans replaced rye up to 100 acres allowed by the operator. At $40 of operating capital per acre, the optimum farm plan goes to the high yield goals as summarized in Table 6. This, again, is the unlimited capital solution.

CONCLUSIONS

Extension and Research are recommending Maximum Economic Yield (MEY) as a way to meet the current cost/price squeeze. The theoretical framework for MEY is to increase profits by increasing resource utilization until the Marginal Value Product of the resource is equal to the cost of the resource plus interest. MEY is being used to focus producers attention on reducing production risk by ensuring that management pays attention to "all" production details. This appears to be a sound recommendation for farmers with unlimited operating capital. What should be our recommendation with limited capital?

Our total farm study suggests that the financial risk to take advantage of the Government Program was relatively small. With as little as $10 operating capital per acre the study farm operator could capitalize on most of the benefits of the Government program.

As operating capital is increased, the optimum solution changes not only as to the type of crop mix selected, but also in the yield goals selected for the alternative crops. This analysis suggests that Maximum Economic Yield is not the same for all operating capital situations. This means that MEY

recommendations should not be made independent of the financial situation of the farmer. The more limited the operating capital, the more prominent the lower yield goals.

Field Testing Of Proto-type MEY Model

After designing and testing the proto-type MEY model for selecting alternative yield goals with a study farm, we decided to go to the field and test the model with other farm situations. In the spring of 1987 we had county agents hand pick 10 farmers that had good farm records and would be willing to work with a Beta Test Version of this farm management tool. The months of February and March 1987 were used to test our proto-type MEY model with these hand selected farmers.

Farmer interest in MEY is very high. It appears that North Dakota's top farmers are doing considerable evaluation of enterprise selection to cope with the current cost/price squeeze. The problem is that even these top farmers were constrained somewhat with the limited cost accounting data that they had to work with. We had to develop farm-level procedures for allocating total farm operating expenses out to each crop acre. Even those farmers with computerized farm accounting systems, were uncomfortable with the cost allocation systems they had set up in their accounting systems. Clearly, cost accounting data was limiting their managerial planning. Each test farmer, however, expressed interest in learning more about cost accounting.

NDSU's Extension Economics Section believes that the teachable moment is here to teach top farmers how to do cost accounting for enterprise selection. We are now planning a major educational program on Cost Accounting And How It Can Be Used In Enterprise Selection.

Identified A Need For "Reduced Input Farming (RIF) Systems Research"

Our test farmer experience suggests North Dakota Farmers are not even considering multiple yield goals. They were unable to or unwilling to think of the resource requirements for alternative yield goals. It became evident that Extension needs to develop an "On-Farm-System" for determining resource requirements for alternative yield goals. One North Dakota Experiment Station is now starting a research project on Reduced Input Farming (RIF) Systems.

A project proposal has been written on Reduced Input Farming (RIF) Systems and submitted to USDA laying a development plan for designing this "On-Farm-System. We are planning to hire an agronomist to conduct a thorough literature review on Reduced Input Farming (RIF) Systems and then develop a computerized on-farm procedure for determining a producer's specific resource requirements for: (1) Reduced Input Farming (RIF) yield goals, (2) conventional yield goals, and (3) Intensive Cereal Management (ICM) yield goals. The purpose of the proposed project is to develop a computerized decision guide that farmers can use to integrate conventional data, ICM data, and RIF data into a single integrated on-farm enterprise selection tool.

Table 8. OPTIMAL FARM PLANS WITH ALTERNATIVE LEVELS OF OPERATING CAPITAL

CROP	OPERATING CAPITAL PER ACRE $5	$10	$15	$20	$25	$30	$35	$40
Spring Wheat 15 bu	--	--	--	--	--	--	--	--
40 bu	--	--	--	--	--	--	--	--
Green Manure	--	--	--	--	--	--	--	--
Winter Wheat 20 bu	--	--	--	--	--	--	--	--
40 bu	133	274	290	290	290	134	--	--
60 bu	--	--	--	--	--	156	290	290
Barley 20 bu	--	--	42	55	42	--	--	--
60 bu	--	--	--	--	13	--	80	--
80 bu	--	--	--	--	--	55	--	80
Hay	37	75	25	25	25	25	--	--
Winter Rye 25 bu	--	--	--	--	--	--	--	--
45 bu	--	--	141	327	500	500	437	400
ACR (Set-Aside)	60	122	130	130	130	130	130	130
Soybeans	--	--	--	--	--	--	62	100
Idle	230	472	372	173	--	--	--	--
Rent-Out	541	55	--	--	--	--	--	--